Bacteria Growth

- Growth Medium - Agar
  - General Purpose – straight agar
  - Enrichment Medium – nutrient, blood
  - Selective Medium – Penicillin in agar grows only gram negative
  - Differential Medium
- Physical Conditions
  - Temperature
    - Species have different optimal conditions
    - We will use 37°C
  - pH
    - Most 6.5 – 7.5
    - Some are acidophilic
    - Some are alkaliphilic
  - Oxygen Requirements
    - Some Aerobic
    - Some Obligate Anaerobic
    - Some Facultative Anaerobic
- Measuring Growth
  - Direct count
  - Dilution series – dilute to make count easier
  - Turbidity – cloudy liquid
  - Dry weight
- Killing Bacteria
  - Autoclave – heats to 121°C for 15 min
  - Ethylene oxide – used on plastics
  - Pasteurization -milk – heated for ~30 sec @ 74°C
- Gram Stain
  - Different bacteria stain different colors caused by different layers/thickness of cell wall
  - Two Types
    - Gram + : Purple = crystal violet
    - Gram - : Red = red safranin
  - Used to help identify strains of bacteria

Kingdoms Archaebacteria and Eubacteria

- Characteristics
  - Lack Membrane-bound organelles (nucleus, mitochondria)
  - Three main shapes:
    - Bacilli (Rods)
    - Coccus (sphere)
    - Spirillium (spiral)
  - Variation on shapes
    - Strepto- Chain like. Streptococcus
    - Staph- Grape like. Staphlycoccus
    - Diplo- In twos. Diplococcus
  - Many have rigid cell walls which protect from hostile environments and/or flagella for movement.
  - Have pili which look like flagella, but aid in anchoring to living tissue and transferring genetic material.
- Reproduction of Prokaryotes

    - Reproduce by binary fission
        - Loop of DNA replicates
        - Cell grow
        - Splits in half
- Two cell's genetic info can be combined:
    - Transduction, a virus carries DNA from one cell to another.
    - Transformation, DNA from a broken cell is taken up by a living one.
    - Conjugation, pili connects cells.
        - DNA moves from the donor to the recipient where recombination occurs.
    - through plasmids - small extra-chromosomal pieces of DNA
- Bacterial Metabolism
    - Bacteria may be aerobes, obligate anaerobes, or facultative anaerobes.
    - In unfavorable conditions, some form spores that are resistant to heat and drying.
    - Photosynthetic, Chemosynthetic and Heterotrophic bacteria
    - Success can be attributed to their varied metabolic abilities, rapid reproductive rate, ability to form spores and small size.
- Bacteria Disease
    - Some Bacteria are Good or Harmless
    - Opportunistic Bacteria – only cause trouble if opportunity arises
    - Exotoxin – secreted protein is toxic
    - Endotoxin – part of cell wall causes reaction
    - Spread of Infection
        - Physical Contact
        - Airborne – dust, droplets
        - Food – borne (or water)
        - Insect borne
    - Koch's Postulates
        - Same bacteria must be present in all that have the disease
        - Must be isolated and grown in a culture
        - Cause same disease when injected into an experimental animal
        - Recovered from experimental animal